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EXAMINER

ENSEY, BRIAN

| ART UNIT | PAPER NUMBER |
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2643

DATE MAILED: 07/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/924,073

Applicant(s)

HOU, ZEZHANG

Examiner

Brian Ensey

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on amendment A filed 5/12/04.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 and 24-35 is/are rejected.
- 7) ☒ Claim(s) 19-23 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 24-26, 28-30 is rejected under 35 U.S.C. 102(b) as being anticipated by Engrebretson et al. U.S. Patent No. 5,724,433.

Regarding claim 24, Engrebretson discloses a method for amplifying sound signals in a multi-band sound processing system, said method comprising: receiving a signal level estimate for a channel signal corresponding to a particular frequency band of a sound signal; and determining a suitable gain amount for the channel signal based on the signal level estimate, wherein, when the signal estimate has a high level, the suitable gain amount is constrained to limit the variation of gain difference across frequency bands, thereby preserving speech clarity and intelligibility, and wherein, when the signal level estimate does not have a high level, the suitable gain amount is not constrained (See Figs. 5 and 6, col. 4, line 24 to col. 5, line 12 and col. 7, line 56 to col. 8, line 57).

Regarding claim 25, Engrebretson further discloses filtering a sound signal to obtain a plurality of channels, including the channel signal (See Fig. 6).

Regarding claim 26, Engrebretson discloses a system for processing sound signals for hearing impaired persons, said system comprising: a microphone to convert a sound pressure

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signal into an electronic sound signal; a signal processing unit operatively connected to said microphone, said signal processing unit operates to filter the electronic sound signal to obtain channel signals for at least two channels, determine an estimated signal level for each of the channel signals, determine an initial gain amount for each of the channel signals based on the estimated signal level, constrain the initial gain amounts for the channel signals by combining the initial gain amount with other gain amounts associated with neighboring channel to produce constrained gain amounts, amplify the channel signals in accordance with the constrained initial gain amount, and combine the amplified channel signal into a processed electronic sound signal; and a receiver to convert the processed electronic sound signal to a sound pressure signal (See Figs. 5 and 6, col. 4, line 24 to col. 5, line 12 and col. 7, line 56 to col. 8, line 57).

Regarding claim 28, Engrebretson discloses a system for amplifying sound signals in a multi-band sound processing system, said system comprising: a microphone to convert a sound pressure signal into an electronic sound signal; a signal processing unit operatively connected to said microphone, said signal processing unit operates to filter the electronic sound signal to obtain channel signals for at least two channels with different frequency bands, receive a signal level estimate for each of the channel signals, and determine a suitable gain amount for each of the channel signals based on the signal level estimate corresponding to each of the channel signals, wherein, when the signal level estimate has a high level, the suitable amount is constrained to preserve spectrum contrast across frequency bands (See Figs. 5 and 6, col. 4, line 24 to col. 5, line 12 and col. 7, line 56 to col. 8, line 57).

Regarding claim 29, Engrebretson discloses a system for amplifying sound signals in a multi-band sound processing system, said system comprising: a microphone to convert a sound

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pressure signal into an electronic sound signal; a signal processing unit operatively connected to said microphone, said signal processing unit operates to filter the electronic sound signal to obtain channel signals for at least two channels with different frequency bands, receive a signal level estimate for each of the channel signals, and determine a suitable gain amount for each of the channel signals based on the signal level estimate corresponding to each of the channel signals, wherein, when the signal level estimate has a high level, the suitable amount is constrained to limit variation of gain difference across frequency bands, and wherein, when the signal level estimate does not have a high level, the suitable gain amount is not constrained (See Figs. 5 and 6, col. 4, line 24 to col. 5, line 12 and col. 7, line 56 to col. 8, line 57).

Regarding claim 30, Engrebretson discloses a hearing aid device, comprising: a microphone (12) for picking up a sound signal; signal processing circuitry (110,120) operatively connected to said microphone, said signal processing circuitry operating to process the sound signal to produce a modified sound signal; and an output device (30) that produces an output sound in accordance with the modified sound signal, wherein said signal processing circuitry operates to filter the sound signal into a plurality of channel signals of different frequency bands, obtain signal level estimates for each of the channel signals, and determine suitable gain amounts for the channel signals based on the signal level estimates, and wherein, in determining each of the suitable gain amounts, when the signal level estimate has a high level, the corresponding suitable gain amount is constrained against gain amounts associated with one or more other channel signals (See Figs. 5 and 6, col. 4, line 24 to col. 5, line 12 and col. 7, line 56 to col. 8, line 57).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 13-15, 27, 31-33 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Engrebretson et al. U.S. Patent No. 5,724,433.

5. Regarding claim 13, Engrebretson discloses a method for amplifying sound signals in a multi-band sound processing system, said method comprising: receiving a signal level estimate for a channel signal corresponding to a particular frequency band of a sound signal; and determining a suitable gain amount for the channel signal based on the signal level estimate, wherein, when the signal estimate has a high level, the suitable gain amount is constrained (See Figs. 5 and 6, col. 4, line 24 to col. 5, line 12 and col. 7, line 56 to col. 8, line 57). Engrebretson does not expressly disclose said constraining serves to preserve spectrum contrast across frequency bands, thereby preserving speech clarity and intelligibility. However, Engrebretson teaches said constraining preserves band-shaping and maintains the signal envelope across all the frequency bands and it would have been obvious to one of ordinary skill in the art at the time of the invention that this preservation would inherently maintain speech clarity and intelligibility.

Regarding claim 14, Engrebretson further discloses, said determining comprises: comparing the signal level estimate for the channel signal to a first threshold amount; and constraining the suitable gain amount for the channel signal when said comparing determines

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that the signal level estimate exceeds the first threshold amount (See Figs. 5 and 6, col. 4, line 24 to col. 5, line 12 and col. 7, line 56 to col. 8, line 57).

Regarding claim 15, Engrebretson further discloses said determining comprises; producing an initial gain amount for the channel signal; comparing the signal level estimate for the channel signal to a first threshold amount; producing the suitable gain amount as the initial gain amount when said comparing determines that the signal level estimate is less than the first threshold amount; and constraining the initial gain amount and then producing the suitable gain amount as the constrained initial gain amount when said comparing determines that the signal level is greater than the first threshold amount (See Figs. 5 and 6, col. 4, line 24 to col. 5, line 12 and col. 7, line 56 to col. 8, line 57).

Regarding claim 27, Engrebretson does not expressly disclose the signal processing unit is a digital signal processor. However, Engrebretson teaches the circuit may be implemented using digital components (See col. 4, lines 24-31). It is well-known in the art that signal processing performed with discrete digital components can be replicated using a digital signal processor, Official Notice taken and it would have been obvious to one of ordinary skill in the art at the time of the invention to use a DSP to save space and costs.

Regarding claims 31 and 32, Engrebretson further discloses constraining one or more of the suitable gain amounts and limits the variation of gain difference across frequency bands(See col. 7, line 56 through col. 8, line 57) Engrebretson does not expressly disclose said constraining serves to preserve spectrum contrast across frequency bands, thereby preserving speech clarity and intelligibility. However, Engrebretson teaches said constraining preserves band-shaping and maintains the signal envelope across all the frequency bands and it would have been obvious to

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one of ordinary skill in the art at the time of the invention that this preservation would inherently maintain speech clarity and intelligibility.

Regarding claim 33, Engrebretson discloses a computer program code for processing sound signals, said computer readable medium comprising: computer program code for filtering a sound signal to obtain a channel signal for a channel; computer program code for determining an estimated signal level for the channel signal; computer program code for determining an initial gain amount for the channel signal based on the estimated signal level; computer program code for constraining the initial gain amount for the channel signal in view of gain amounts associated with at least one neighboring channel; computer program code for amplifying the channel signal in accordance with the constrained initial gain amount (See Fig. 6, col. 2, lines 11-22, col. 3, lines 20-44, col. 16, lines 55-60 and Appendix A). Engrebretson does not expressly disclose the code is stored on a computer readable medium. However, it is inherent for a computer program code to be stored on a computer readable medium and it would have been obvious to one of ordinary skill in the art at the time of the invention to use a computer readable medium for distribution to a large number of users.

Regarding claim 35, Engrebretson further discloses the channel signal pertains to a frequency band, and wherein said computer readable medium further comprises: computer program code for combining the amplified channel signal with other amplified channel signals from other frequency bands of the sound signal (See Fig. 6, col. 2, lines 11-22, col. 3, lines 20-44, col. 16, lines 55-60 and Appendix A).

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6. Claims 1-12, 16-18 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Engrebretson as applied to claim 33 above, and further in view of Schmidt U.S. Patent No. 5,832,444.

7. Regarding claim 1, Engrebretson discloses a method for processing sound signals for hearing impaired persons, said method comprising: (a) filtering a sound signal to obtain channel signals for at least two channels; (b) determining an estimated signal level for each of the channel signals; (c) determining an initial gain amount for each of the channel signals; (d) constraining the initial gain amount for each of the channel signals channel based on the corresponding estimated signal levels; and (e) amplifying the channel signal in accordance with the corresponding constrained initial gain amount (See Figs. 5 and 6, col. 4, line 24 to col. 5, line 12 and col. 7, line 56 to col. 8, line 57). Engrebretson does not expressly disclose constraining the gain amounts against gain amounts associated with at least one neighboring channel based on the corresponding estimated signal levels. However, Schmidt teaches normalization of the control signals for a multi-band compression system thereby averaging the gains to a reference level over all channels including at least one neighboring channel (See col. 4, lines 15-34). It would have been obvious to one of ordinary skill in the art at the time of the invention to sample the output from one or all channels for gain control to minimize spectral distortion and maintain speech intelligibility.

Regarding claim 2, Engrebretson further discloses said constraining (d) comprises: (d1) comparing the estimated signal level to at least one threshold level to obtain comparison information (See Figs. 5 and 6, col. 4, line 24 to col. 5, line 12 and col. 7, line 56 to col. 8, line 57). Engrebretson does not expressly disclose constraining the initial gain amount for the channel

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signal against at least one gain amount associated with at least one neighboring channel based on the comparison information. However, Schmidt teaches normalization of the control signals for a multi-band compression system thereby averaging the gains to a reference level over all channels including at least one neighboring channel (See col. 4, lines 15-34). It would have been obvious to one of ordinary skill in the art at the time of the invention to sample the output from one or all channels for gain control to minimize spectral distortion and maintain speech intelligibility.

Regarding claim 3, Engrebretson further discloses the channel signal pertains to a frequency band, and said method further comprises: (f) combining the amplified channel signal with other amplified channel signals from other frequency bands of the sound signal (See Figs. 5 and 6, col. 4, line 24 to col. 5, line 12 and col. 7, line 56 to col. 8, line 57).

Regarding claim 4, Engrebretson further discloses said constraining (d) comprises: (d1) comparing the estimated signal level to at least one threshold level to obtain comparison information (See Figs. 5 and 6, col. 4, line 24 to col. 5, line 12 and col. 7, line 56 to col. 8, line 57). Engrebretson does not expressly disclose constraining the initial gain amount for the channel signal against at least one gain amount associated with at least one neighboring channel based on the comparison information. However, Schmidt teaches normalization of the control signals for a multi-band compression system thereby averaging the gains to a reference level over all channels including at least one neighboring channel (See col. 4, lines 15-34). It would have been obvious to one of ordinary skill in the art at the time of the invention to sample the output from one or all channels for gain control to minimize spectral distortion and maintain speech intelligibility.

Regarding claims 5-8, Engrebretson discloses a method as claimed in claim 1 above. Engrebretson does not expressly disclose said constraining operates to average the initial gain

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amount for the channel signal with at least one other gain amount associated with a neighboring channel wherein the average operation is a weighted average, the neighboring channel is a channel adjacent to the channel and the neighboring channel pertains to a lower frequency band that is adjacent to the frequency band for the channel. However, Schmidt teaches normalization of the control signals for a multi-band compression system to minimize spectral distortion and average the gains to a reference level over all channels (See col. 4, lines 15-34). It would have been obvious to one of ordinary skill in the art at the time of the invention to sample the output from one or all channels for gain control to minimize spectral distortion and maintain speech intelligibility.

Regarding claims 9-11, Engrebretson does not expressly disclose said constraining (d) operates to average the initial gain amount for the channel signal with a plurality of other gain amounts associated with neighboring channels wherein the average operation is a weighted average, the neighboring channel is a channel adjacent to the channel and the neighboring channel pertains to a lower frequency band that is adjacent to the frequency band for the channel. However, Schmidt teaches normalization of the control signals for a multiband compression system to minimize spectral distortion and average the gains to a reference level over all channels (See col. 4, lines 15-34). It would have been obvious to one of ordinary skill in the art at the time of the invention to sample the output from one or all channels for gain control to minimize spectral distortion and maintain speech intelligibility.

Regarding claim 12, Engrebretson further discloses the neighboring channels include at least one channel at a lower frequency band that is proximate to the frequency band for the

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channel, and at least one channel at a higher frequency band that is proximate to the frequency band of the channel (See col. 7, line 66 through col. 8, line 16).

Regarding claims 16-18, Engrebretson discloses a method as claimed in claim 13 above. Engrebretson does not expressly disclose said constraining operates to average the initial gain amount for the channel signal with at least one other gain amount associated with a neighboring channel wherein the average operation is a weighted average and the neighboring channel is a channel adjacent to the channel. However, Schmidt teaches normalization of the control signals for a multi-band compression system to minimize spectral distortion and average the gains to a reference level over all channels (See col. 4, lines 15-34). It would have been obvious to one of ordinary skill in the art at the time of the invention to sample the output from one or all channels for gain control to minimize spectral distortion and maintain speech intelligibility.

Regarding claim 34, Engrebretson discloses program code as claimed in claim 33 above. Engrebretson further discloses computer program code for comparing the estimated signal level to at least one threshold level to obtain comparison information. Engrebretson does not expressly disclose computer program code for constraining the initial gain amount for the channel signal against a gain amount associated with at least one neighboring channel based on the comparison information. However, Schmidt teaches normalization of the control signals for a multi-band compression system to minimize spectral distortion (See col. 4, lines 15-34). It would have been obvious to one of ordinary skill in the art at the time of the invention to sample the output from one or all channels for gain control to minimize spectral distortion and maintain speech intelligibility.

Allowable Subject Matter

Claims 19-23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

Applicant's arguments filed 5/12/04 have been fully considered but they are not persuasive.

Engrebretson teaches that each channel response can be programmed to be a band pass filter which is contiguous with adjacent filters and that the filters can be programmed to produce overlapping channels (See Fig. 4 and col. 7, line 63 to col. 8, line 16). The examiner submits that Engrebretson provides the ability to adapt the program to adjust gain based on signal levels of at least one neighboring channel. Further Engrebretson teaches setting the gain level of the channel amplifier based on the signal level with reference to a threshold level. The examiner submits that the determination of constraining the initial gain is based on the reference signal level. Therefore, in the event of a high initial signal level, the gain will be constrained and in some cases, reduces the gain if it is too high and further takes no action to constrain/reduce the gain if the signal level is not high. All actions regarding the gain are relative to the initial level. Engrebretson also teaches the operation of the hearing aid is to vary the frequency response and the gain as a function of level to preserve spectral shaping. Further, Schmidt teaches the elimination of spectral distortion through normalization of level estimates. However, Schmidt also teaches that the exact position of the level estimate will depend on the individual signal contained in each

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band, preserving the shape of the amplitude contained in each band. Although Schmidt operates on channels individually, it would have been obvious for one of ordinary skill in the art to combine the individual channel shaping of Schmidt with the overlapping channel processing of Engrebretson.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian Ensey whose telephone number is 703-305-7363. The examiner can normally be reached on Mon-Fri: 8:00 - 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Curtis Kuntz can be reached on 703-305-4708. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Any response to this action should be mailed to:

Commissioner of Patents and Trademarks
Washington, D.C. 20231


Or faxed to:

(703) 872-9306, for formal communications intended for entry and for
informal or draft communications, please label "PROPOSED" or "DRAFT".

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive,
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BKE
July 20, 2004


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